



King's Research Portal

DOI:

[10.1111/psyg.12385](https://doi.org/10.1111/psyg.12385)

Document Version

Peer reviewed version

[Link to publication record in King's Research Portal](#)

Citation for published version (APA):

Wesenberg, S., Mueller, C., Nestmann, F., & Holthoff-Detto, V. (2018). Effects of an animal-assisted intervention on social behaviour, emotions, and behavioural and psychological symptoms in nursing home residents with dementia. *Psychogeriatrics*. . <https://doi.org/10.1111/psyg.12385>

Citing this paper

Please note that where the full-text provided on King's Research Portal is the Author Accepted Manuscript or Post-Print version this may differ from the final Published version. If citing, it is advised that you check and use the publisher's definitive version for pagination, volume/issue, and date of publication details. And where the final published version is provided on the Research Portal, if citing you are again advised to check the publisher's website for any subsequent corrections.

General rights

Copyright and moral rights for the publications made accessible in the Research Portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognize and abide by the legal requirements associated with these rights.

- Users may download and print one copy of any publication from the Research Portal for the purpose of private study or research.
- You may not further distribute the material or use it for any profit-making activity or commercial gain
- You may freely distribute the URL identifying the publication in the Research Portal

Take down policy

If you believe that this document breaches copyright please contact librarypure@kcl.ac.uk providing details, and we will remove access to the work immediately and investigate your claim.

Effects of an animal-assisted intervention on social behaviour, emotions and behavioural and psychological symptoms in nursing home residents with dementia

Wesenberg, Sandra; Mueller, Christoph; Nestmann, Frank; Holthoff-Detto, Vjera

Author's accepted manuscript: doi: 10.1111/psyg.12385

Corresponding author

Prof. Dr. Sandra Wesenberg
Alice Salomon Hochschule - University of Applied Sciences
Alice-Salomon-Platz 5, 12627 Berlin
Berlin, Germany
E-mail: wesenberg@ash-berlin.eu
Tel.: +49 - 176 34394471

Authors

Dr. Christoph Mueller
King's College London
Department of Old Age Psychiatry
London, UK
E-mail: christoph.mueller@kcl.ac.uk

Prof. Dr. Frank Nestmann
Technische Universität Dresden
Faculty of Education
01062 Dresden
Dresden, Germany
E-mail: frank.nestmann@tu-dresden.de

Prof. Dr. Vjera Holthoff-Detto
Alexianer Krankenhaus Hedwigshöhe
Clinic for psychiatry, psychotherapy und psychosomatic
Höhensteig 1
12526 Berlin
Berlin, Germany
E-mail: V.Holthoff-Detto@alexianer.de

Field: BPSD and Non-pharmacological Therapy

Short Running Title: Effects of animal-assisted interventions

Effects of an animal-assisted intervention on social behaviour, emotions and behavioural and psychological symptoms in nursing home residents with dementia

Abstract

Background: Positive effects of animal-assisted interventions in people with dementia are frequently reported in the literature. It however remains unclear if the positive effects are directly due to the presence of the animal. Aim of this study was to investigate if the inclusion of an animal adds value to psychosocial interventions for people with dementia.

Methods: The study followed a within-subject design with two studied conditions (animal-assisted intervention/control intervention) and several measurement points (baseline: at beginning of the intervention, after three months and after six months). Nineteen nursing home residents suffering from dementia participated in the animal-assisted intervention (with a dog) and the control intervention. Both interventions were delivered as weekly group sessions over a period of 6 months.

Outcomes examined were social interaction, emotional expression and behavioural and psychological symptoms. These outcomes were evaluated at baseline and after 3 and 6 months using video recordings.

Results: Nineteen patients with moderate to moderately severe dementia, living in two nursing homes in Germany, were included. During the animal-assisted intervention we detected significantly longer, and more frequent periods of positive emotions (pleasure) and social interaction (e.g. touch, body movements) compared to the control intervention.

Conclusions: The presence of a dog appears to have beneficial effects on psychosocial intervention for people with dementia.

Keywords: dementia, Alzheimer Disease (AD), nursing homes, non-pharmacological therapy, animal-assisted intervention

Introduction

As epidemiological predictions suggest that dementia prevalence will continue to increase (1), and the effects of pharmacological treatments are at best modest, there is a need to establish a better evidence-base for psychosocial interventions. There has been an increasing research interest in animal-assisted interventions and NICE-SCIE-guideline recommends these especially for dementia patients with agitation, anxiety or depression (2). Numerous studies describe the positive effects of animal interactions on people with dementia, as an increase in social interaction (3–6); improved balance (7); activation and improved motor skills (8–10); reduction in agitation (3, 5, 11) and depressive symptoms (4, 10–14); improved general emotional wellbeing (8, 15–18) and quality of life (14, 19). A current systematic review by Yakimicki et al. (20) discusses the relationship between animal-assisted interventions and the occurrence of behavioural and psychological symptoms of dementia. The majority of the 32 studies included in the review highlight various benefits of utilizing AAI to alleviate some symptoms or to improve social behaviour. But the authors also point out some important limiting factors; e.g. study designs and statistical methods varied widely, making it difficult to compare studies.

In summary, existing study results are very heterogeneous, with large variations in study design, interventions, participants, baseline and outcome measures. In most of these studies, validity is impeded by methodological weaknesses and low numbers of participants and results need to be confirmed in more rigorous, larger scale studies.

An important unanswered question is if the presence of the animal provides additional benefits (in comparison with interventions solely based on human interaction). For example, Furstenberg and colleagues noted in their studies (21, 22), that the enthusiasm of the volunteer dog handlers alone might have motivated and engaged participants. It is further possible that some effects in animal-assisted group programs are grounded in group dynamic processes which might have occurred in similar way without the presence of the animal. As Lutwack-Bloom et al. (23) pointed out, “the

question to be answered revolved around finding what, exactly, where the benefits of bringing in a dog” (p. 145).

We therefore aimed to determine how specifically the inclusion of an animal in a psychosocial intervention is beneficial for patients as opposed to a similar intervention without the animal.

Methods

The study presented here is part of a larger feasibility study on animal-assisted intervention in persons suffering moderate to moderately severe dementia (NE 421/4-1; project leader: Vjera Holthoff-Detto, Frank Nestmann; 2010 to 2013) funded by the German Research Foundation (Deutsche Forschungsgesellschaft, DFG) (24, 25). The substudy focused on the question of the potential 'added value' of a dog-assisted intervention for nursing home residents with dementia and to examine the effects of the patient-dog interaction in detail. The Ethics Committee of the Technical University Dresden, Germany, approved the study and prior to initiation written consent was obtained by the legal representatives of all participants.

Study Population

A total of nineteen patients with moderate to moderately severe dementia meeting the criteria for AD (Alzheimer's disease; NINCDS-ADRDA criteria; 26, 27) and VD (vascular dementia, NINDS-AIREN criteria, 28) residing in two nursing homes in Dresden were included in the study. The diagnoses were confirmed by old age psychiatrists based on the patients' medical history and their own evaluation. Additional testing was administered by the study physicians as part of the study design: Mini Mental State Examination (MMSE; 29); Alzheimer's Disease Assessment Scale-cognitive subscale (ADAS-cog; 30), Neuropsychiatric Inventory (NPI; 31, 32) and Alzheimer's Disease Cooperative Study - Activities of Daily Living Inventory (ADAS-ADL; 33).

Patients were required to speak German as the dominant language (necessary for testing), and there were no contraindications to animal-assisted therapy (immobility, a compromised immune system, pet hair allergy, dog phobia). Patients needed to be on a stable dose of pharmacological dementia treatment with acetylcholinesterase inhibitor or memantine or combination for at least 6 months. Changes in medication that could influence cognitive functioning (e.g. benzodiazepines, sleep aids, neuroleptics) were documented throughout the intervention.

Design

The study followed a within-subject design with two studied conditions (animal-assisted intervention/control intervention) and several measurement points (baseline: at beginning of the intervention, after three months and after six months). This design is best placed for feasibility studies with small sample sizes, as participants serve as their own control reducing risk of selection bias and confounding (34).

Animal-assisted intervention (AAI)

The animal assisted intervention was delivered as a therapy program called ‚Tierische Tandems‘ (‚animal tandems‘) is based on the established US-based ‚Pet Encounters Program‘ (35–37). Effects on activity levels, cognitive, motor, social and emotional abilities in relation to this program were demonstrated in two pilot studies (35, 36). A comparable structured, evidence-based program does not exist in German speaking regions. With the kind agreement of the authors we translated the manual for the ‚Pet Encounters Program‘ into German (applying the parallel blind technique, 38) and adapted all major items in the ‚animal tandems‘ program. In addition to the aforementioned items, further exercises were adopted from the student manual from the ‚Pet Partners Team Training Course‘ published by the Delta Society (39) and the practice guide ‚Tiergestützte Therapie in Senioren- und Pflegeheimen‘ (40).

The animal-assisted intervention was conducted by trained dog owners with knowledge of both, the people (patients with dementia) and the animals (dogs) involved (IAHAIO 2014). Volunteer dog owners received a 100-hour structured training course delivered by experienced old age psychiatrists, highly qualified non-medical clinicians (e.g. an experienced occupational therapist), and experts on animal-assisted interventions. This course conveyed theoretical and practical knowledge about human-animal-relationships and animal assisted interventions. Further, dog

owners were trained in interacting with people with dementia. The suitability of the dogs was tested by a veterinarian and a dog therapist. No restrictions were made regarding the breed of the dog (breeds taking part were e.g. French bulldog, Poodle, German shepherd, Staffordshire terrier, Labrador, Dachshund).

The program was delivered in weekly group sessions with 5 participants each conducted by one human-dog team. Participants were sitting in a semi-circle around an open space, which could be used for activities with the dog and was visible for each participant. Each session started with a standardized round of introductions (5-10 minutes), during which the trained dog owners introduced themselves and their dogs: e.g. the trained dog owner offered the participant to welcome the dog by stroking them. In the end of each session a short feedback and farewell round took place (5-10 minutes): e.g. the trained dog owner offered the participant to shake their hand and to give the dog a treat.

Sessions and exercises followed a standardized manual (41). The animal-assisted intervention targeted emotional wellbeing (e.g. stroking and brushing the dog to facilitate closeness and physical contact), cognitive stimulation (e.g. reminiscence of participants' own pets, practicing obedience commands), initiating social contacts (e.g. exercises together with the dog), and improving motor function (e.g. retrieving drills, walking the dog on a leash).

Control intervention (CI)

To specifically evaluate the effects of an animal-assisted intervention to a comparable psychosocial intervention (without the inclusion of animals), a control condition was created. The control intervention without dogs was conducted weekly by three trained volunteers over 6 months in a group of five. These volunteers were trained by the same experts as the dog owners, old age psychiatrists and experienced non-medical clinicians, and they were comparable in demographics as age and gender. In the control intervention the various exercises were slightly modified to be as close to the original intervention as possible. An example exercise for motor skills involved

throwing games, similar to the fetch-stick exercises carried out with the dogs. Sessions were conducted in the same rooms and followed the same structure (reception – exercises – feedback and farewell) and had the same length as the animal-assisted interventions (45 minutes).

Coding and analysis

We examined three outcomes: social interaction, emotional expression and behavioural and psychological symptoms. Outcome data was collected at baseline and after 3 and 6 months.

Of every intervention 30 minutes were videoed and later coded. This allowed us to measure changes over time, differences in both interventions at the specific time points, as well as group-by-time interactions. We devised a coding system based on existing rating scales for the three outcome categories.

Social interaction was coded based on existing coding schemes, previously used in research on animal-assisted interventions in nursing homes (5, 6, 42, 43). We divided the codes into four subcategories: 'verbal interaction', 'non-verbal interaction – touch', 'non-verbal interaction – line of gaze', 'non-verbal – body posture'. We further differentiated if the behaviour was directed towards a person, an animal, an object, or self-directed.

The coding scheme for 'emotional expression' is based on established rating scales for emotions: the Facial Action Coding System (FACS; 44) and the (modified) Observed Emotion Rating Scale (OERS; 45–47). The OERS captures five emotional states and uses a two-dimensional concept of emotions: positive (pleasure, general alertness) and negative (anger, anxiety/fear, sadness). It has been used in a number of studies on emotional expression in dementia (47–49; studies on AAI: 8, 18) and its validity and responsiveness in this group are well established (47).

Coding of behavioural and psychological symptoms was based on the neuropsychiatric inventory (NPI) (31, 32) by applying the same 10 domains of behavioural changes for our analysis.

We used the INTERACT software (Mangold International, Arnstorf, Germany) to code video recordings, which has been used in studies on animal-assisted interventions (50, 51). The coding was conducted by one research associate (Sandra Wesenberg) and two project team members (Lydia Wolff, Ismail Davul). All raters were trained in the method (procedure adapted from 52) and we piloted the coding procedure prior to the full analysis to ensure sufficient inter-rater reliability (Cohen's Kappa > 0.6).

For one recording of a group of five participants, the video was analysed five times, registering behaviour for each participant at a time. We recorded the frequency and duration of outcome behaviour, which were later analysed in SPSS 21. Due to the small sample size, nonparametric testing seems to be most appropriate (53). To test for differences between the two interventions at the various time points we used the non-parametric Wilcoxon signed-ranks test. We further examined for group-by-time interactions using the Friedman rank test (with post hoc Wilcoxon signed-ranks tests for pairwise comparisons). P values were adjusted for multiple testing by using the Benjamini-Hochberg False Discovery Rate (FDR) procedure (54).

Results

Of the originally 19 participants who consented to take part, two dropped out shortly after the start of the study (one participant passed away and the other withdrew without giving a reason).

Sociodemographic data and Mini Mental State Examination (MMSE) scores (29) on the 17 participants who participated in the interventions over 6 months are presented in Table 1. The large majority of participants (76%) was female, and the male to female ratio 1:4 reflecting gender distribution in German nursing homes (55). The mean group age was 85.7 years. Participants suffered moderate to moderately severe dementia and had a mean MMSE score at baseline of 15.18. As expected MMSE scores declined to a mean of 13.6 during the study length of 6 months.

Insert Table 1 here

Patient-dog interaction and social interaction

We differentiated between verbal and non-verbal interactions and between participant-animal, participant-participant and participant-dog owner/-group facilitator interaction. Physical contact/touch between the patients and the dogs was significantly longer in the animal-assisted intervention as in the control intervention at all three-time points ($p < 0.001$, Table 2). There was no significant difference in duration observed between time points.

Figure 1a shows that most of physical contacts occurred between participants and the dog. The nursing home residents petted the dog and, in some cases, let their hand rest on the animal. Direct physical contacts between participants or between participant and dog owner/ group facilitator were rare and of short duration in both interventions.

We further observed the body movements of the participants and focused on upper body movements (moving towards the dog, an object or another person). Significantly more upper body movements were observed in the dog-assisted intervention and they were significantly longer ($p < 0.001$) at all time points when compared to the control intervention. There was no significant difference revealed between the time points (see Table 2, Figure 1b).

Additionally, we examined the participants' gaze behaviour, referring to the duration of focused gaze between participant-dog, participant-participant, participant-trained dog owner/-group facilitator. In the animal-assisted intervention the participants followed mainly the dog whereas in the control intervention their gaze followed the group facilitator and there was no difference observed between the interventions or the time points (Figure 1c).

We further examined verbal interaction of the nursing home residents with other participants, the dog owner/group facilitator or the dog. Longer periods of verbal communication were observed in the intervention group (Table 3), which was significant at the 6-months' time point. In both interventions the participants talk the longest to dog owner/group facilitator (Figure 1d). Participants rarely communicate with each other, but directly with the dog if present. They often called the dog or spoke to the animal calmly while petting.

Insert Table 2 and Figure 1 here

Emotional expression

Negative emotions (anger, anxiety/fear, sadness) were only recorded in a minority of participants ($n=5$) and were of short duration. There was no difference within or between interventions or time points.

Positive emotions (pleasure, general alertness) were observed to a great extent in both interventions and at all time points. Significant differences between the intervention and control intervention were detected in the duration of 'pleasure' as measured in seconds. The between group difference was significant at baseline (T1) and the 6-months' time point (T3) ($p < 0.01$) (Table 3).

Overall, durations of several emotional expressions differed highly between different participants, which is reflected in relatively large standard deviations (Table 3).

Insert Table 3 here

Behavioural and psychological symptoms

Behavioural and psychological symptoms were rarely detected in both the animal-assisted intervention and the control intervention. We observed those almost exclusively in a subgroup of four patients, who were in the moderate to severe stages of dementia. The most frequently detected symptom was apathy, which occurred in 12% to 29% of patients per time point. Others were aberrant motor behaviour (0–12%); disinhibition, hallucinations, delusions, euphoria, and irritability (0–6 %, respectively). The average duration of such behaviours did not differ between interventions, nor time points.

Discussion

The aim of this study was to investigate the advantages of including an animal into a therapy program for people with dementia living in nursing homes. As in other studies, the evaluation of the video data clearly demonstrates the promotion of social contacts in the animal-assisted program (5, 15, 56, 57). Participants interacted more often in the dog-assisted intervention than in the control intervention without dog. Both non-verbal and verbal interactions occurred more frequently in the intervention condition. Most of the interactions and contacts were directly between the person with dementia and the dog. The participants frequently followed the dog with their eyes, moved towards the animal, talked to or petted it. The large majority of differences in observed time periods of interactions between the intervention and control condition could be accounted to an 'additional' interaction with the dog.

The positive effects on mood and well-being described in several other investigations are also clearly proven (8, 17, 18). In our study, participants enjoyed both the animal-assisted intervention and the control intervention. It is known from the literature that positive emotions are often observed in nursing home residents if they are in company, if their personal interests are accounted for, if they are talked to directly or if they are involved in (group-) activities (55, 58). So, both the animal-assisted intervention and the control intervention are expected to increase nursing home residents' wellbeing. The positive effects on pleasure were significantly larger in the animal-assisted intervention and the participation of an animal provided thereby 'added value' compared to the control intervention.

AAI-specific effects on behavioural and psychological symptoms of dementia were not shown in our study. It is of note that some previous studies of animal-assisted interventions in dementia have predominantly focused on the reduction of agitation and aggression in patients suffering from severe behavioural and psychological symptoms of dementia, especially agitation, and/or on the reduction of symptoms in everyday life, not in the intervention itself (3, 5, 11, 13, 14). The focus of

our study was different, and due to the small number of participants exhibiting behavioural disturbances we could not draw conclusions on this question.

Most participants responded positively to the presence of the dog, and negative reactions were rare. Emotions like anger or anxiety were hardly observed. The low drop-out rate ($n=2$) was also indicative of good acceptability. This could partly be due to selection bias, as people with dementia or their relatives might have opted not to participate in the study due to disinterest, dislike or allergies to animals.

The positive effects of animal assisted interventions on social interaction and emotional well-being of people with dementia can be explained through a complex interplay of various factors. Of central importance is the communication between humans and animals, which happens largely via the reception and interpretation of visual, tactile, auditory and olfactory stimuli and signals (59). With worsening dementia, the ability to communicate verbally and to understand verbal communication decreases. 'Analogue' non-verbal communication, for example through touching the animal, is retained longer. Further, animal-assisted interventions use biographical stimuli, building on emotionally important contents from long-term memory. Animals frequently elicit positive memories in older people, for example of previous pets. Animals are able to bridge communication between humans; they serve as a reason for and a topic of communication, and enhance interpersonal contact as co-called 'social catalysts' (60).

One limitation of this controlled feasibility study is the small sample size. We therefore chose the within-subject-design, in which the same participants were enrolled in an animal assisted intervention as well as a control intervention. This reduces the risk of selection bias and confounding and thereby is better placed to evaluate differences in the studied interventions than e.g. a parallel group design. A disadvantage of the design is the possibility of carryover effects, which means that participation in one intervention may affect performance in another intervention. One possibility of reducing carry-over effects is having a time gap between control and intervention condition (61). To avoid interference between the two interventions, they were carried out on

separate weekdays. The risk of carryover effects was thereby reduced, but the presence of these effects cannot be ruled out completely. A further limitation might be differences in personalities and behaviours between trained dog owners and volunteers conducting the control intervention. We attempted to minimise these through using the same experts to train both groups, and trained dog owners and control group volunteers were comparable in age and gender.

We used technically assisted observation, which is an established method to examine short term effects of animal-assisted and other psychosocial interventions in persons with dementia. The video recorded material can be assessed from different perspectives, focusing on details of interest. It further allows comparison between individuals. A drawback might be that participants are more active when a camera is present (62, 63). We acknowledged this when planning the investigations and didn't notice any specific reaction of the participants to the presence of the camera.

The animal-assisted intervention improved the psychosocial wellbeing of people with dementia to a substantially larger degree than the control intervention. The longer and more frequent periods of positive emotions and social interactions in the animal assisted interventions could be specifically attributed to the presence of the dog, thus implying an added benefit of the animal in this therapy model. The dog appears to provide a highly compelling stimulus, triggering a positive reaction in participants.

Future research could compare animal-assisted with other psychosocial interventions (as e.g. music therapy) or pharmacotherapies. It is further important to examine interactions between different therapeutic approaches (e.g. animal-assisted and reminiscence therapies), including the possibility to combine these as part of a multi-modal treatment strategy.

Acknowledgment

The study was funded by the German Research Foundation (Deutsche Forschungsgemeinschaft, DFG; NE 421/4-1). Fressnapf Tiernahrungs GmbH (Fressnapf Holding, a German franchise company for pet food) supported the implementation of the animal-assisted intervention (fees and equipment for the human-dog teams).

Disclosure statement

There are no financial relationships between any of the authors and an organization with a vested interest in the conduct and reporting of the study.

References

1. Prince M, Comas-Herrera A, Knapp M, et al. World Alzheimer report 2016: Improving healthcare for people living with dementia: coverage, quality and costs now and in the future. 2016.
2. National Institute for Health and Clinical Excellence, Social Care Institute for Excellence, eds. Dementia: A NICE-SCIE guideline on supporting people with dementia and their carers in health and social care: British Psychological Society; 2007, last update: 2016.
3. Richeson NE. Effects of animal-assisted therapy on agitated behaviors and social interactions of older adults with dementia. *American Journal of Alzheimer's Disease & Other Dementias*. 2003;18(6):353–8.
4. Berry A, Borgi M, Terranova L, et al. Developing effective animal-assisted intervention programs involving visiting dogs for institutionalized geriatric patients: A pilot study. *Psychogeriatrics*. 2012;12(3):143–50.
5. Churchill M, Safaoui J, McCabe BW, et al. Using a therapy dog to alleviate the agitation and desocialization of people with Alzheimer's disease. *Journal of psychosocial nursing and mental health services*. 1999;37(4):16–22.
6. Kongable LG, Buckwalter KC, Stolley JM. The effects of pet therapy on the social behavior of institutionalized Alzheimer's clients. *Archives of Psychiatric Nursing*. 1989:191–8.
7. Olsen C, Pedersen I, Bergland A, et al. Effect of animal-assisted activity on balance and quality of life in home-dwelling persons with dementia. *Geriatric nursing*. 2016;37(4):284–91.
8. Mossello E, Ridolfi A, Mello AM, et al. Animal-assisted activity and emotional status of patients with Alzheimer's disease in day care. *International Psychogeriatrics*. 2011;23(6):899–905.
9. Nordgren L, Engström G. Animal-assisted intervention in dementia: Effects on quality of life. *Clin Nurs Res*. 2014;23(1):7–19.
10. Friedmann E, Galik E, Thomas SA, et al. Evaluation of a pet-assisted living intervention for improving functional status in assisted living residents with mild to moderate cognitive impairment: A pilot study. *American Journal of Alzheimer's Disease & Other Dementias*. 2015;30(3):276–89.

11. Majić T, Gutzmann H, Heinz A, et al. Animal-assisted therapy and agitation and depression in nursing home residents with dementia: A matched case–control trial. *The American Journal of Geriatric Psychiatry*. 2013;21(11):1052–9.
12. Moretti F, Ronchi D de, Bernabei V, et al. Pet therapy in elderly patients with mental illness. *Psychogeriatrics*. 2011;11(2):125–9.
13. Travers C, Perkins J, Rand J, et al. An evaluation of dog-assisted therapy for residents of aged care facilities with dementia. *Anthrozoös*. 2013;26(2):213–25.
14. Olsen C, Pedersen I, Bergland A, et al. Effect of animal-assisted interventions on depression, agitation and quality of life in nursing home residents suffering from cognitive impairment or dementia: A cluster randomized controlled trial. *Int J Geriatr Psychiatry*. 2016;31(12):1312–21.
15. Batson K, McCabe BW, Baun MM et al. The Effect of a Therapy Dog on Socialization and Physiological Indicators of Stress in Persons Diagnosed With Alzheimer's Disease. In: Wilson CC, Turner DC, eds. *Companion Animals in Human Health*: SAGE Publications; 1998:203–216.
16. Kawamura N, Niiyama M, Niiyama H. Long-term evaluation of animal-assisted therapy for institutionalized elderly people: A preliminary result. *Psychogeriatrics*. 2007;7(1):8–13.
17. Püllen R, Coy M, Hunger B, et al. Animal-assisted therapy for demented patients in acute care hospitals. *Zeitschrift für Gerontologie und Geriatrie*. 2013;46(3):233–6.
18. Blesch KS. *Vergleich des Einflusses von Hundebesuchsdienst und Gemeinsamen Singen auf die Gefühlszustände demenzkranker Bewohner eines Pflegeheims* [Diploma Thesis]. Heidelberg: University; 2010.
19. Nordgren L, Engström G. Effects of animal-assisted therapy on behavioral and/or psychological symptoms in dementia: A case report. *American Journal of Alzheimer's Disease & Other Dementias®*. 2012;27(8):625–32.
20. Yakimicki ML, Edwards NE, Richards E, et al. Animal-Assisted Intervention and Dementia: A Systematic Review. *Clin Nurs Res*. 2018.
21. Furstenberg, F. F., Rhodes, P. S., Powell, S. K., & Dunlop, T. The effectiveness of pet therapy on nursing-home patients suffering with dementia. *Gerontologist*. 1984;24:245.

22. Furstenberg FF, Rhodes PS, Powell SK. Short-term value of pets. *American Journal of Nursing*. 1988;88:157.
23. Lutwack-Bloom P, Wijewickrama R, Smith B. Effects of pets versus people visits with nursing home residents. *Journal of Gerontological Social Work*. 2005;44(3-4):137–59.
24. Wesenberg S, Beckmann A, Nestmann F, et al., eds. *Tierische Tandems. Theorie und Praxis tiergestützter Arbeit mit älteren und demenzerkrankten Menschen. Band I: Grundlagen*. Tübingen: dgvt-Verlag; 2016.
25. Wesenberg S, Beckmann A, Nestmann F, et al., eds. *Tierische Tandems. Theorie und Praxis tiergestützter Arbeit mit älteren und demenzerkrankten Menschen. Band II: Manual*. Tübingen: dgvt-Verlag; 2016.
26. Dubois B, Feldman HH, Jacova C, et al. Research criteria for the diagnosis of Alzheimer's disease: Revising the NINCDS-ADRDA criteria. *Lancet Neurol*. 2007;6(8):734–46.
27. McKhann G, Drachman D, Folstein M, et al. Clinical diagnosis of Alzheimer's disease: report of the NINCDS-ADRDA Work Group under the auspices of Department of Health and Human Services Task Force on Alzheimer's Disease. *Neurology*. 1984;34(7):939–44.
28. Roman GC, Tatemichi TK, Erkinjuntti T, et al. Vascular dementia: Diagnostic criteria for research studies. Report of the NINDS-AIREN International Workshop. *Neurology*. 1993;43(2):250–60.
29. Folstein MF, Folstein SE, McHugh PR. "Mini-mental state": A practical method for grading the cognitive state of patients for the clinician. *Journal of psychiatric research*. 1975;12(3):189–98.
30. Rosen WG, Mohs RC, Davis KL. A new rating scale for Alzheimer's disease. *The American journal of psychiatry*. 1984;141:1356–64.
31. Cummings JL. The Neuropsychiatric Inventory Assessing psychopathology in dementia patients. *Neurology*. 1997;48(5 Suppl 6):10S-16S.
32. Cummings JL, Mega M, Gray K, et al. The Neuropsychiatric Inventory comprehensive assessment of psychopathology in dementia. *Neurology*. 1994;44(12):2308.
33. Galasko D, Bennett D, Sano M, et al. An inventory to assess activities of daily living for clinical trials in Alzheimer's disease. *Alzheimer disease and associated disorders*. 1997;(Suppl 2):S33-S39.

34. Gerrig RJ, Zimbardo PG. *Psychologie.*: Pearson; 2008.
35. Buettner LL. Pet encounters: Animal-assisted therapy for frail older adults. *Activities Directors' Quarterly for Alzheimer's and Other Dementia Patients*. 2008;9(1):29–45.
36. Buettner LL, Fitzsimmons S. *Pet Encounters: AAT for frail older adults: [unpublished]*; n.d.
37. Buettner LL, Martindale B, Bussey L et al. *Community connections: recreation therapy - animal assisted therapy rural outreach*. The University of North Carolina at Greensboro; n.d.
38. Werner O, Campbell DT. Translating, working through interpreters, and the problem of decentering. In: Naroll C, Cohen R, eds. *A handbook of method in cultural anthropology*. Doubleday: National history press; 1970:420.
39. Delta Society. The Pet Partners team training course manual. A Delta Society program for animal-assisted activities and animal-assisted therapy; 1996.
40. Kahlisch A. *Tiergestützte Therapie in Senioren-und Pflegeheimen: Ein Wegweiser mit Praxisbeispielen für Besuchshundeteams.*: Kynos Verlag; 2010.
41. Beckmann A, Werner J, Wesenberg S. Manual zum tiergestützten Interventionsprogramm „Tierische Tandems“. In: Wesenberg S, Beckmann A, Nestmann F, et al., eds. *Tierische Tandems. Theorie und Praxis tiergestützter Arbeit mit älteren und demenzerkrankten Menschen. Band II: Manual*. Tübingen: dgvt-Verlag; 2016:7–80.
42. Fick KM. The influence of an animal on social interactions of nursing home residents in a group setting. *American Journal of Occupational Therapy*. 1993;47(6):529–34.
43. Kramer SC, Friedmann E, Bernstein PL. Comparison of the effect of human interaction, animal-assisted therapy, and AIBO-assisted therapy on long-term care residents with dementia. *Anthrozoös*. 2009;22(1):43–57.
44. Ekman P, Friesen WV. *Facial Action Coding System: A technique for the measurement of facial movement.*: Consulting Psychologists Press; 1978.
45. Banks MR, Willoughby LM, Banks WA. Animal-assisted therapy and loneliness in nursing homes: Use of robotic versus living dogs. *Journal of the American Medical Directors Association*. 2008;9(3):173–7.

46. Lawton MP, van Haitsma K, Klapper J. Observed affect in nursing home residents with Alzheimer's disease. *The Journals of Gerontology Series B: Psychological Sciences and Social Sciences*. 1996;51(1):P3-P14.
47. Oppikofer S. Lebensqualität bei Demenz. *Zürcher Schriften zur Gerontologie Bd.* 2008;5:
48. Phillips LJ, Reid-Arndt SA, Pak Y. Effects of a creative expression intervention on emotions, communication, and quality of life in persons with dementia. *Nursing research*. 2010;59(6):417–25.
49. Walters D. The effect of multi-sensory ministry on the affect and engagement of women with dementia. *Dementia*. 2007;6(2):233–43.
50. Prothmann A, Albrecht K, Dietrich S, et al. Analysis of child—dog play behavior in child psychiatry. *Anthrozoös*. 2005;18(1):43–58.
51. Prothmann A. Tiergestützte Kinderpsychotherapie. *Frankfurt a. M.: Peter Lang*. 2007.
52. Washington CC, Moss M. Pragmatic aspects of establishing interrater reliability in research. *Nursing research*. 1988;37(3):190–1.
53. Bortz J, Lienert GA. *Kurzgefasste Statistik für die klinische Forschung. Leitfaden für die verteilungsfreie Analyse kleiner Stichproben*. Wiesbaden: Springer; 2008.
54. Benjamini Y, Hochberg Y. Controlling the false discovery rate: A practical and powerful approach to multiple testing. *Journal of the royal statistical society. Series B (Methodological)*. 1995:289–300.
55. Schäufele M, Lode S, Hendlmeier I, et al. *Demenzkrankte in der stationären Altenhilfe: Aktuelle Inanspruchnahme, Versorgungskonzepte und Trends am Beispiel Baden-Württembergs.*: W. Kohlhammer Verlag; 2008.
56. Bernabei V, Ronchi D de, La Ferla T, et al. Animal-assisted interventions for elderly patients affected by dementia or psychiatric disorders: A review. *Journal of psychiatric research*. 2013;47(6):762–73.
57. Sellers DM. The Evaluation of an Animal Assisted Therapy Intervention for Elders with Dementia in Long-Term Care. *Activities, Adaptation & Aging*. 2006;30(1):61–77.
58. Bär M, Kruse A, Re S. Emotional bedeutsame Situationen im Alltag demenzkranker Heimbewohner. *Zeitschrift für Gerontologie und Geriatrie*. 2003;36:454–62.

59. Watzlawick P, Beavin JH, Jackson DD. *Menschliche Kommunikation*..: Huber; 1969.
60. Levinson BM. The dog as a" co-therapist.". *Mental Hygiene*. 1962;46:59–65.
61. Kittner L. Grundbegriffe. In: Guttman G, ed. *Allgemeine Psychologie. Experimentalpsychologische Grundlagen*..: WUV-Universitätsverlag; 1994:1–20.
62. Knoblauch H, Schnettler B, Raab J. Video-Analysis. Methodological aspects of interpretive audiovisual analysis in social research. In: Knoblauch H, Schnettler B, Raab J, et al., eds. *Video analysis: Methodology and methods*: Peter Lang; 2012:9–24.
63. Haidet KK, Tate J, Divirgilio-Thomas D, et al. Methods to improve reliability of video-recorded behavioral data. *Research in nursing & health*. 2009;32(4):465–74.

Figure Legend

Figure 1: Durations of social interactions with the dog, the dog-owner/ group facilitator and other people: A) physical contact, B) body movement, C) gaze, D) verbal interaction

Tables

Table 1: Sociodemographic data

Sex	male	n = 4
	female	n = 13
Age (Mean; SD)		85,65 ± 4,83
MMST (Mean; SD)		15,18 ± 6,11

Table 2: Durations (in seconds) of social interactions in the two interventions at the three time points

Intervention	Time point	Verbal communication	Non-verbal – Touch	Non-verbal – Line of gaze	Non-verbal – Body posture
		Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)
Animal assisted intervention	T1	140,01 (123,06)	37,90 (24,25)**	807,37 (112,73)	91,64 (71,20)**
	T2	144,35 (94,32)	38,15 (17,12)**	782,55 (115,84)	98,45 (65,36)**
	T3	147,63 (93,06)*	32,74 (16,67)**	782,80 (134,00)	65,56 (27,79)**
Control intervention	T1	79,97 (54,85)	5,97 (5,17)	716,92 (201,77)	12,75 (9,60)
	T2	125,84 (103,83)	5,56 (7,17)	729,21 (125,25)	20,60 (15,99)
	T3	90,75 (43,43)	3,29 (2,08)	756,05 (140,34)	11,66 (10,65)

(* significant differences between groups, $p < 0.01$; ** significant differences between groups, $p < 0.001$)

Table 3: Durations (in seconds) of observed emotions in the two interventions at the three time points

Intervention	Time point	Pleasure	General alertness	Anger	Anxiety	Sadness
		Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)
Animal assisted intervention	T1	186,66 (137,05)*	797,86 (134,55)	2,73 (7,53)	1,29 (2,85)	0,00 (0,00)
	T2	184,85 (165,01)	795,56 (112,24)	0,14 (0,58)	0,00 (0,00)	0,00 (0,00)
	T3	149,37 (148,04)*	825,24 (156,25)	0,41 (1,68)	2,44 (9,79)	3,33 (9,36)
Control intervention	T1	61,75 (92,56)	753,03 (244,14)	0,32 (1,33)	0,00 (0,00)	17,09 (63,40)
	T2	115,90 (155,68)	806,01 (183,47)	5,19 (18,67)	0,08 (0,35)	5,79 (16,60)
	T3	100,56 (181,89)	790,60 (187,46)	0,03 (0,14)	0,00 (0,00)	4,30 (13,19)

(* significant differences between groups, $p < 0.01$)